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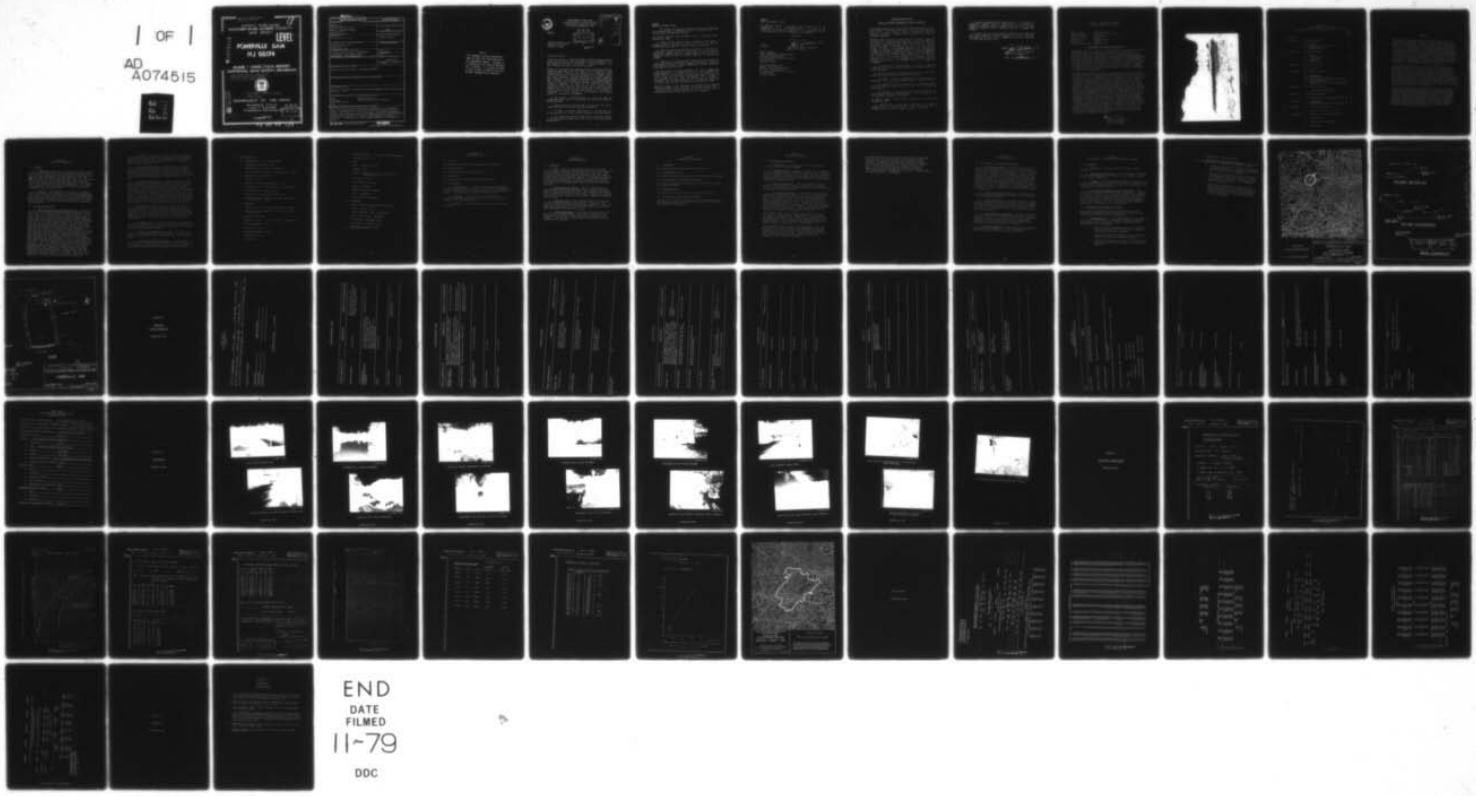

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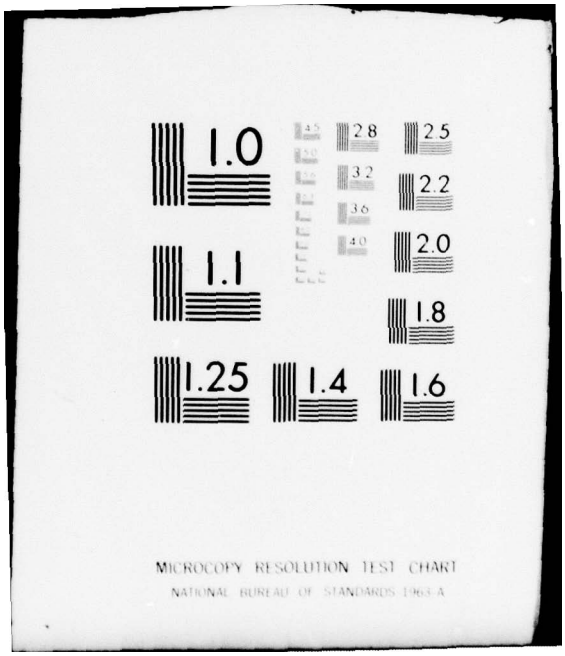
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PASSAIC RIVER BASIN
ROCKWAY RIVER, MORRIS COUNTY
NEW JERSEY

LEVEL II

POWERVILLE DAM
NJ 00174

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Powerville Dam (NJ-00174). Passaic River Basin, Rockway River, Morris County, New Jersey. Phase 1 Inspection Report.

(9) Final rept., (10) Warren A. /Guinan

(15) DACW61-79-C-0011

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

(12) 74p.

(11) June 1979

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Structural Analysis
Flow
Powerville Dam, NJ
National Dam Inspection Act Report

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT. CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

REPLY REFER TO
NAPEN-D

20 SEP 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Powerville Dam in Morris County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Powerville Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The dam's spillway is considered inadequate since 21 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the dam's reduced hazard classification and expectation that failure of the structure would probably result in no loss of life. For the above reasons, no further studies to more precisely determine the adequacy of the spillway are recommended. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The question of ownership must be resolved so that the recommended remedial measures and operating and maintenance procedures may be undertaken.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Make a technical investigation of the spillway weir during a period of low flow to identify seepage and stability problems.

(2) Design and supervise repairs to the undermined concrete of the east spillway abutment and to the concrete in the dam spillway and wing walls.

(3) Evaluate the need for the gate structure at the west end of the dam and repair or permanently plug it. Do not plug it if it is the only means of drawdown for the lake.

Any remedial measures found necessary should be initiated within calendar year 1980.

c. Within 30 days from the date of approval of this report a program should be initiated to check the condition of the dam periodically and to watch for changes in seepage or stability.

d. Within six months from the date of approval of this report a surveillance program should be established for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure.

e. Within one year from the date of approval of this report the owner should engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-D
Honorable Brendan T. Byrne

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

POWERVILLE DAM (NJ00174)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 14 May 1979 by Anderson-Nichols & Co., Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Powerville Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The dam's spillway is considered inadequate since 21 percent of the Spillway Design Flood--SDF - would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the dam's reduced hazard classification and expectation that failure of the structure would probably result in no loss of life. For the above reasons, no further studies to more precisely determine the adequacy of the spillway are recommended. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The question of ownership must be resolved so that the recommended remedial measures and operating and maintenance procedures may be undertaken.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Make a technical investigation of the spillway weir during a period of low flow to identify seepage and stability problems.

(2) Design and supervise repairs to the undermined concrete of the east spillway abutment and to the concrete in the dam spillway and wing walls.

(3) Evaluate the need for the gate structure at the west end of the dam and repair or permanently plug it. Do not plug it if it is the only means of drawdown for the lake.

Any remedial measures found necessary should be initiated within calendar year 1980.

c. Within 30 days from the date of approval of this report a program should be initiated to check the condition of the dam periodically and to watch for changes in seepage or stability.

d. Within six months from the date of approval of this report a surveillance program should be established for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure.

e. Within one year from the date of approval of this report the owner should engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years.

APPROVED: _____

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 17 September 1979

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Powerville Dam
Identification No.:	Federal ID No. NJ00174
State Located:	New Jersey
County Located:	Morris
Stream:	Rockaway River
River Basin:	Passaic
Date of Inspection:	May 14, 1979

ASSESSMENT OF GENERAL CONDITIONS

Powerville Dam is an old dam of undetermined age and is in overall poor condition. It is small in size and is classified as Significant Hazard. The concrete of the abutments and visible portion of the crest is deteriorated with large aggregate exposed. The east abutment is undermined. The concrete of the wooden gated raceway at the west end of the dam is severely deteriorated and spalled, and water is leaking through the gate. The gate structure is inoperable because of backfill of unknown character placed on the upstream side of the gate opening. The spillway is capable of passing 10% of the PMF without allowing the dam to overtop and is judged to be inadequate.

The question of ownership must be resolved so that the following remedial measures and operating and maintenance procedures may be undertaken. It is recommended that the owner(s) retain the services of a professional engineer qualified in the design and inspection of dams to accomplish the following in the near future: make a technical investigation of the spillway weir during a period of low flow to identify seepage and stability problems; design and supervise repairs to the undermined concrete of the east spillway abutment; design and supervise repairs to the concrete in the dam spillway and wingwalls; and evaluate the need for the gate structure at the west abutment, and repair or permanently plug it. It is further recommended, that as a part of the operating and maintenance procedures, until the dam is rehabilitated or removed, the owner(s) accomplish the following: beginning immediately, check the condition of the dam periodically to watch for changes in seepage or stability; in the future, engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years; beginning in the near future, establish a surveillance program for use during and immediately after periods of heavy rainfall and a warning program to follow in case of floodflow conditions or imminent dam failure.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
N.J. No. 16848

14 MAY 1979

OVERVIEW

POWERVILLE DAM

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PHASE I INSPECTION REPORT
POWERVILLE DAM N.J. NO. 25-81 FED ID NO. NJ00174

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority Authority to perform the Phase I Safety Inspection of Powerville Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 4 April 1979 under Contract No. FPM-39 dated 28 June 1978. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the state and the US Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc. on 14 May 1979.

b. Purpose. The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to safety of Powerville Dam and appurtenances based upon available data and visual inspection, and, determine any need for emergency measures and conclude if additional studies, investigations, and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Powerville Dam is an old (construction date unknown) concrete run-of-river dam. It is approximately 170 feet long with a structural height of 11.9 feet and a hydraulic height of 10.9 feet. The free overflow concrete spillway approximates an ogee shape and extends 125 feet between concrete abutments. Overall, the 12.8 foot wide spillway drops 7.1 feet from its crest to the streambed below the dam. An abandoned gate structure occupies the west (right) abutment. The wooden stoplogs which block the gate opening are backed by a fill which, on the surface, is composed of large boulders. A concrete wall, which may be part of the original mill building, extends from the gate structure approximately 30 feet upstream along the riverbank. Immediately west of the gate structure the dam embankment is a dry stone masonry wall extending for approximately 15 feet to a junction with the banking leading up to Powerville Road, which parallels the river. The east abutment is at the northern limit of a town park area. A wingwall extends from the east spillway abutment approximately 20 feet upstream at a 30^{o} flare. Downstream of this abutment the bank has been partially stabilized with large boulders. Approximately 250 feet downstream, the North Main Street Bridge, which has two openings of 40 feet wide by 13 feet high, spans the river. Essential features of the dam are given in Figure 2.

b. Location. The dam is located in Boonton Township, Morris County, New Jersey about 250 feet upstream of the North Main Street Bridge. Its coordinates are North Latitude 40° 55' and West Longitude 74° 25.7'. A location map is shown in Figure 1.

c. Size Classification. Powerville Dam is classified as being small in size on the basis of its height of 11.9 feet, which is less than 40 feet, and its storage volume of 55 acre-feet, which is less than 1000 acre-feet, but more than 50 acre-feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Visual inspection of the downstream area indicated that a breach of Powerville Dam would likely cause appreciable but not excessive damage to the river banks and channel which are heavily used for recreation. Loss of the reservoir would also be detrimental to property owners upstream of the dam who have a substantial investment in landscaping around the reservoir. It is unlikely that appreciable structural property damage would occur. Failure of the dam would not increase the hazard of loss of life downstream. Because failure of the dam could cause appreciable property damage and loss of recreational opportunities, it is classified as a Significant Hazard.

e. Ownership. Ownership of the dam is unclear. Mr. John Roemer of Flanders, New Jersey owns the property at the west end of the dam and Boonton Township owns the property on the east end of the dam. Neither party claims ownership of the main body of the dam. Mary Rusnack, town clerk and Loren N. Rea, Chairman, Boonton Township Environmental Committee, were contacted for information (201) 334-6891.

f. Purpose of Dam. Powerville Dam was originally designed for water power. At present the dam serves to maintain the existing water level for recreational and aesthetic use by upstream property owners.

g. Design and Construction History. No plans, hydraulic or hydrologic data were disclosed. The only available records indicate that the dam has ledge rock foundation.

h. Normal Operational Procedures. Responsibility for operation of the dam is unclear because of the question of ownership. Most recently Boonton Township, by assertion, has shown responsibility for operation and maintenance.

1.3 Pertinent Data

a. Drainage Area - 116 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown

Total spillway capacity at maximum pool - 3246

c. Elevation (ft. above MSL)

Top Dam - 495.2

Maximum pool-design surcharge - 499.6

Recreation pool - 492 (at time of inspection)

Spillway crest (ungated) - 491.4

Streambed at centerline of dam - 484.3

Maximum tailwater (from North Main St. Bridge rating curve) - 498

d. Reservoir

Length of pool at dam crest elevation - 2300'

Length of recreation pool - 1600' (at time of inspection)

e. Storage (acre-feet)

Recreation pool - 20 (at the time of inspection)

Design surcharge - 116

Top of dam - 54.6

f. Reservoir Surface (acres)

Maximum pool - 9.5

Top dam - 9.5

Recreation pool - 5.0 (at time of inspection)

Spillway crest - 4.5

g. Dam

Type - concrete gravity

Length - 170'

Height - hydraulic 10.9' (See Section 1.2)
structural 11.9'

Top width - 12.8'

Side slopes - vertical

Zoning - unknown

Impervious core - unknown

Cutoff - unknown

Grout curtain - unknown

H. Spillway

Type - concrete approximate ogee shape

Length of weir - 125'

Crest elevation - 491.4' above MSL

Gates - backfilled, inoperable

U/S Channel - Rockaway River

D/S Channel - Rockaway River

I. Regulating Outlets - None

SECTION 2
ENGINEERING DATA

2.1 Design

No engineering design data or plans were disclosed.

2.2 Construction

No construction data were disclosed.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. A search of New Jersey Department of Environmental Protection files and contact with community officials revealed only a limited amount of recorded information. All disclosed information was retrieved.

b. Adequacy. Because of the limited amount of recorded data available, evaluation of this dam was based solely on visual observations.

c. Validity. Visual observations confirm the available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. There is erosion and cracking of the concrete abutment wingwall and undermining of the downstream end of the concrete wingwall at the east end of the dam. The visible portions of the concrete spillway crest are deteriorated with large aggregate exposed. The wingwalls adjacent to the gate structure on the west end of the dam are also cracked and deteriorated. Detailed inspection of the spillway could not be accomplished because of the flow over the spillway.

b. Appurtenant Structures. The old wooden gate in the raceway at the west end of the dam is deteriorated and water is leaking through the gate. The concrete gate structure is badly deteriorated and spalled. Backfill of unknown character has been placed in the raceway immediately upstream of this gate.

c. Reservoir Area. The watershed above the reservoir is gently sloping and partially wooded. There are also numerous houses along the shores of the reservoir. One large tree was observed to be blown into the channel on the west bank immediately upstream of the dam.

d. Downstream Channel. The channel downstream of the dam is wide and unobstructed except for a bridge 250 feet downstream of the dam. There are trees overhanging the channel. Some boulders project above the tailwater 50 feet downstream of the dam.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were disclosed.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were disclosed.

4.4 Warning System

No description of any warning system was disclosed.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures the remedial measures described in Section 7.2 should be implemented as prescribed.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Since no data were disclosed an evaluation could not be performed.

b. Experience Data. Limited information in the New Jersey Department of Environmental Protection files indicate that fill had been placed so as to block the gate structure prior to 1948, and that during a December 1948 storm the fill eroded, draining the dam and causing damage to a mill building which was below the dam.

c. Visual Observation. No visual evidence was disclosed of damage to the structure caused by overtopping. At the time of inspection approximately 0.6 feet of water was flowing over the spillway crest.

d. Overtopping Potential. The hydraulic/hydrologic evaluation for Powerville Dam is based on a spillway design flood (SDF) equal to one-half the probable maximum flood PMF) in accordance with the range of test floods given in the evaluation guidelines for dams classified as significant hazard and small in size. The PMF has been determined by application of the Snyder Unit hydrograph procedure to a 48-hour PMF storm of 22.2 inches. Hydrologic computations are given in Appendix 3. The routed SDF peak discharge for the subject watershed is 16,340 cfs.

The spillway approximates an ogee shape and is 125 feet in length. At the time of inspection 0.6 feet of water was flowing over the crest. The minimum elevation of the dam allows 3.8 feet of depth in the spillway before overtopping begins. Under this head the spillway capacity is 3250 cfs which is less than the required SDF.

At discharges above 11,000 cfs the backwater created by the North Main Street Bridge just downstream of the dam begins to cause less flow over the dam than that which would occur without backwater. The discharge coefficient for the spillway weir has been reduced accordingly. Calculations are shown in Appendix 3.

The small storage volume available compared to discharge, as with most run-of-river dams, causes insignificant reduction in reservoir inflow versus outflow through routing. Calculations indicate that Powerville Dam will be overtopped for 63 hours to a maximum depth of 4.65 feet. It is estimated that the spillway can pass approximately 10% of the PMF or 20% of the required SDF without causing overtopping of the dam. The spillway is thus judged to be inadequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The visual inspection revealed three problems which may pose a threat to the stability of the dam if not corrected: severe deterioration of the abandoned gate structure on the west end of the spillway; spalling of the concrete surface on the spillway; and undermining of the downstream end of the concrete abutment at the east of the dam. Based on the visual inspection it is not possible to determine the character of the dam foundation, the interior of the cross section or the slope with the upstream face below the water surface. Therefore it is not possible to evaluate the factor of safety of the dam against sliding or overturning.

b. Design and Construction Data. No design and construction data pertinent to the structural stability of the dam were disclosed.

c. Operating Records. Available operating records indicate that the fill placed upstream of the old gate structure which was washed out during a storm on December 31, 1948 was replaced sometime prior to April 20, 1949 (the date of an inspection report from which this information was obtained).

d. Post Construction Changes. Available documentation indicates that the timber apron was replaced with concrete in 1937. In 1977 repairs were made to the "dam parapet" and the fill upstream of the "flashboards" (stoplogs) was disturbed during another construction operation unrelated to repairs to the dam.

e. Seismic Stability. Powerville Dam is in Seismic Zone 1 and in accordance with the recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Assessment

a. Condition. Powerville Dam is in poor overall condition.

b. Adequacy of Information. The information available is such that assessment of the dam must be based primarily on the visual inspection.

c. Urgency. The recommendations made in Section 7.2 a. and the operating and maintenance procedures in Section 7.2 c. below should be implemented by the owner as prescribed after receipt of this Phase I report.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which have been outlined in Sections 5 and 6. These problems require the attention of a professional engineer who should make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to instability of the structure.

7.2 Recommendations/Remedial Measures

The question of ownership must be resolved so that the following recommended remedial measures and operating and maintenance procedures may be undertaken.

a. Recommendations. It is recommended that the owner(s) retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following in the near future:

1. Make a technical investigation of the spillway weir during a period of low flow to identify seepage and stability problems.

2. Design and supervise repairs to the undermined concrete of the east spillway abutment.

3. Evaluate the need for the gate structure at the west end of the dam and repair or permanently plug it.

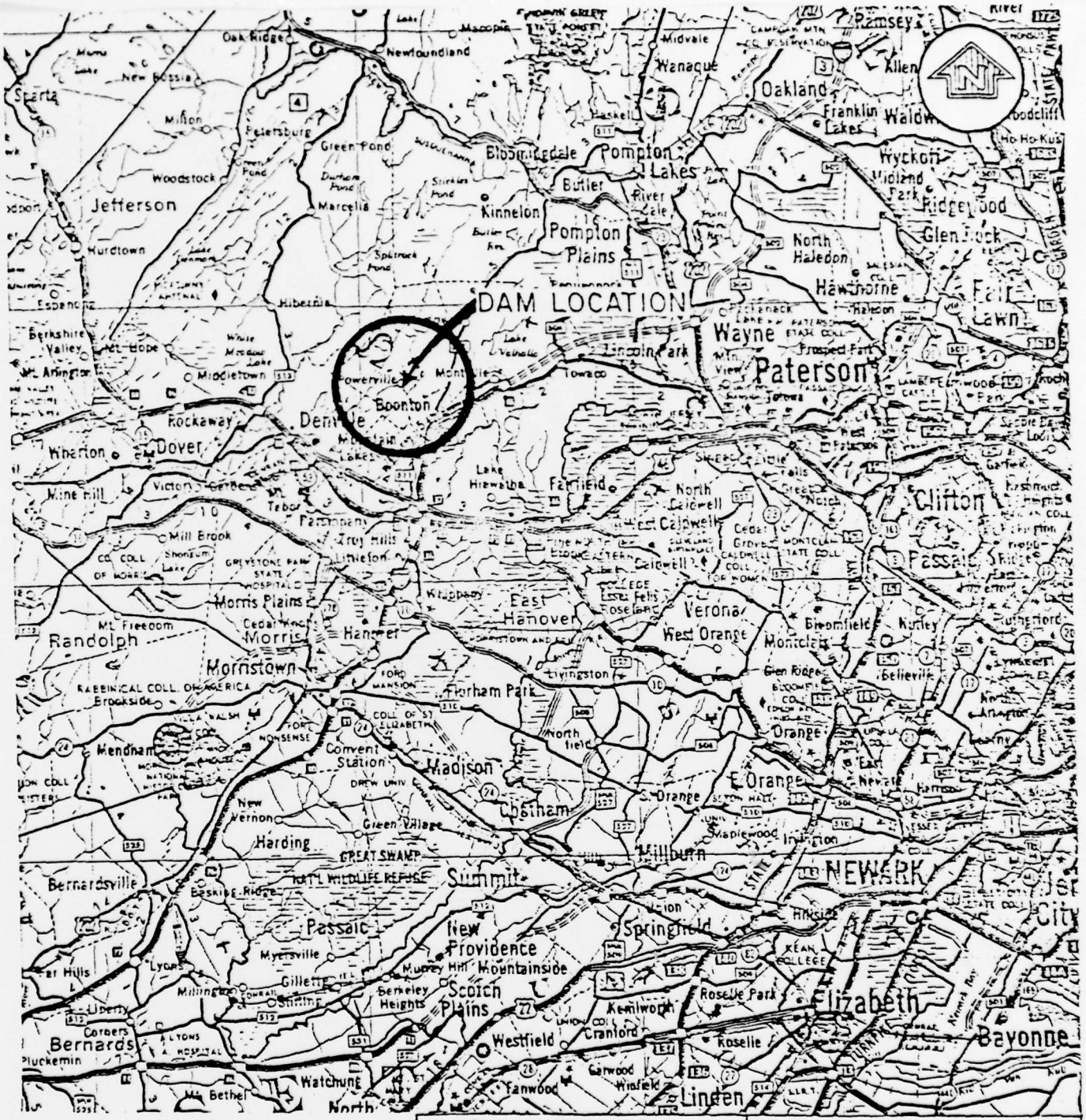
b. Alternative. Remove the dam.

c. Operating and Maintenance Procedures. Until the dam is rehabilitated or removed, the owner(s) should:

1. Check the condition of the dam periodically to watch for changes in seepage or stability. This should be started immediately.

2. Engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years. This should be done in the future.

3. Establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of floodflow conditions or imminent dam failure. This should be done in the near future.



SCALE IN MILES

0 5 10

MAP BASED ON STATE OF NEW JERSEY OFFICIAL HIGHWAY MAP AND GUIDE.

Anderson-Nichols & Co, Inc. BOSTON MASSACHUSETTS	U.S. ARMY ENGINEER DIST. PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

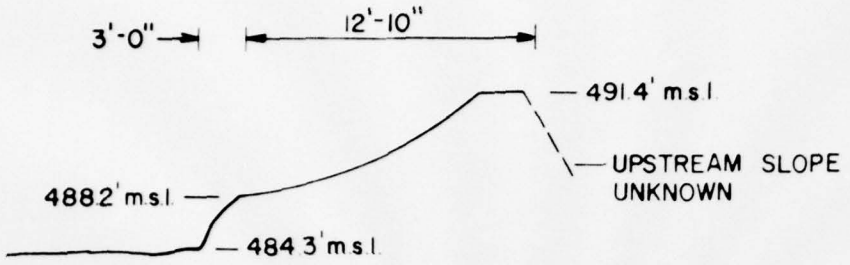
POWERVILLE DAM

LOCATION MAP

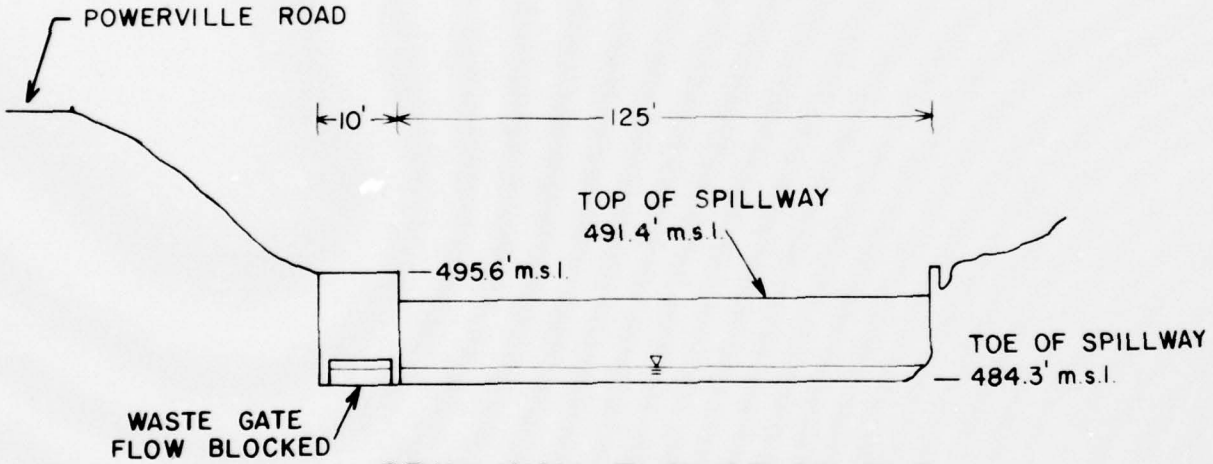
ROCKAWAY RIVER NEW JERSEY

			SCALE: SEE BAR SCALE
			DATE: JUNE, 1979

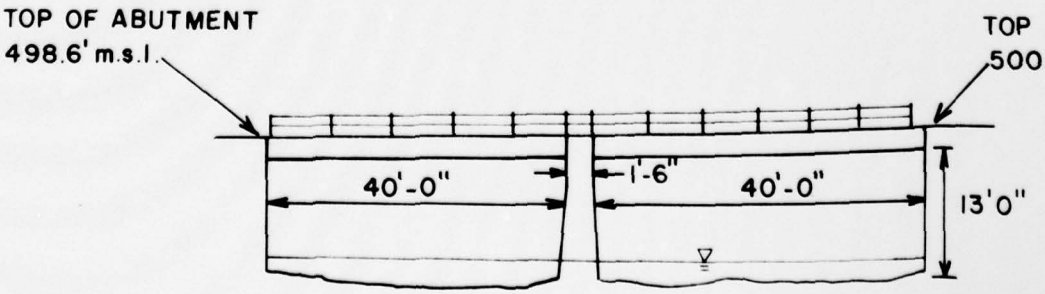
FIGURE 1



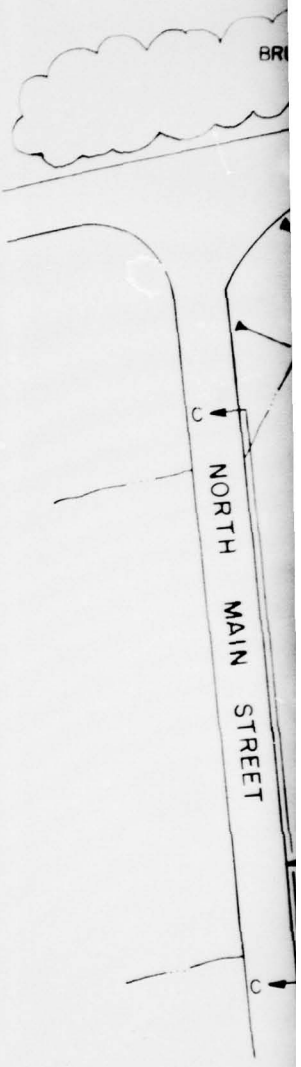
SPILLWAY SECTION A-A

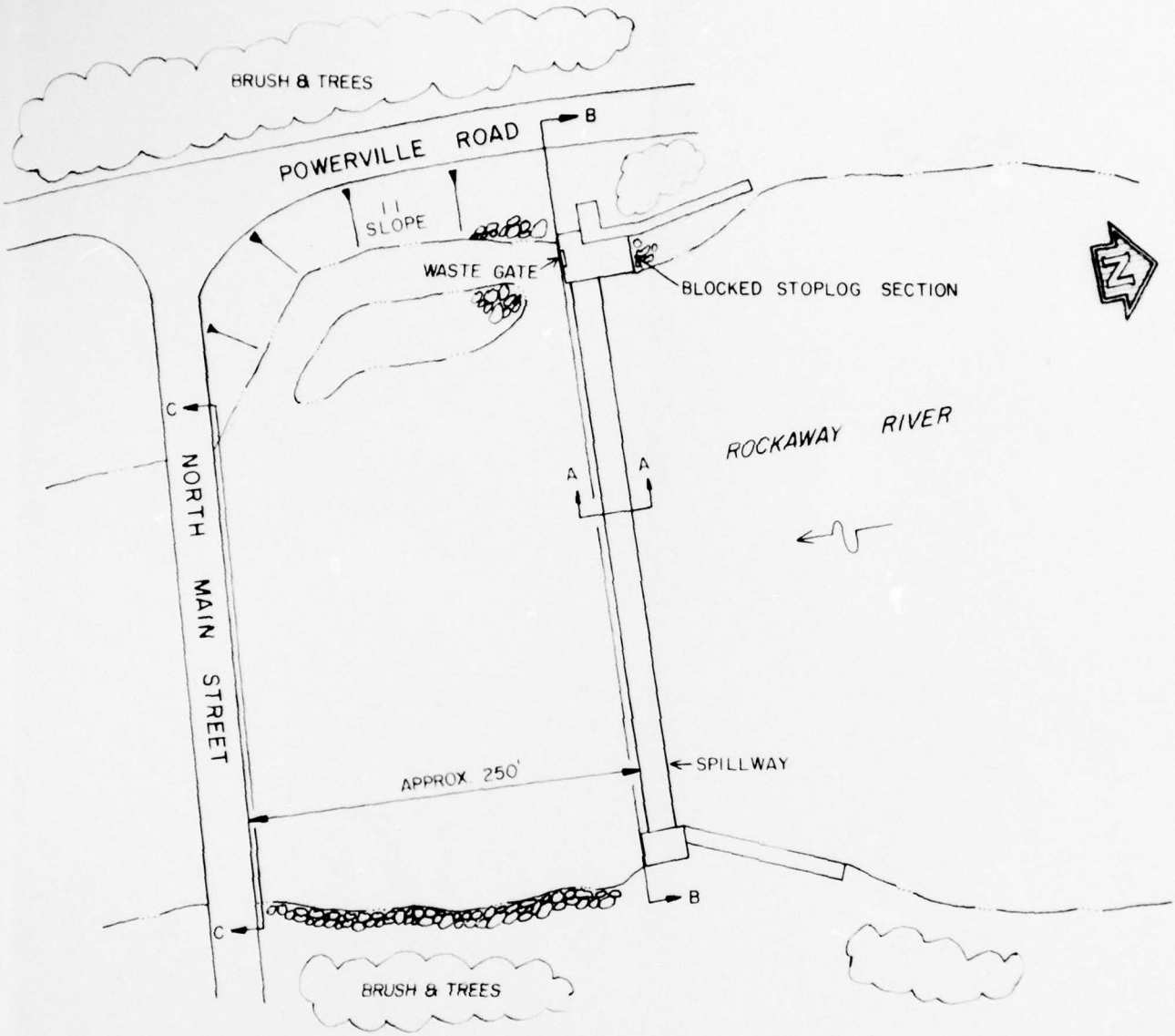


SPILLWAY ELEVATION B-B



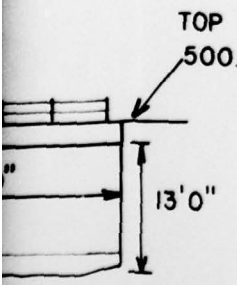
BRIDGE ELEVATION C-C





PLAN

SPILLWAY
.I.



C-C

2

Anderson - Nichols & Co., Inc. BOSTON MASSACHUSETTS	U.S. ARMY ENGINEER DIST. PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

POWERVILLE DAM

ROCKAWAY RIVER NEW JERSEY

SCALE: NOT TO SCALE
DATE: JUNE, 1979

FIGURE 2

APPENDIX 1

CHECKLIST

VISUAL INSPECTION

POWERVILLE DAM

Check List
Visual Inspection
Phase 1

Name Dam Powerville Dam County Morris State New Jersey Coordinators NJDEP

Date(s) Inspection 5-14-79 Weather Cool, rainy Temperature 60°F

Pool Elevation at Time of Inspection 491.99 MSL, Tailwater at Time of Inspection 484.6 MSL

Inspection Personnel:

Warren Guinan — Ronald Hirschfeld

Stephen Gilman —

David Deane —

Gilman & Hirschfeld Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	None observed.	This is a run-of-river dam. Water flowing over crest and tail-water at toe makes it impossible to inspect for seepage at toe.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Significant erosion at downstream side of abutment fill next to wing wall at left end of dam. Old race-way at right abutment has been filled with soil and large boulders have been placed on up-stream face of this fill.	Erosion should be repaired.
DRAINS	None observed.	
WATER PASSAGES	None observed.	See remarks under "Seepage or Leakage" above.
FOUNDATION	Not visible.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Left Abutment: Concrete surfaces eroded & spalled to depth of 2". Severe undermining at water surface. Numerous surface cracks.	Concrete should be repaired.
	Right Abutment: Waste gate structure. U/S portal blocked with stoplogs & boulders. Surface of concrete badly eroded & spalled. Numerous surface cracks - severe undermining at water surface.	Gate structure should be repaired or permanently plugged.
STRUCTURAL CRACKING	Some vertical cracking of abutment walls.	Spillway could not be observed because of flow over crest.
VERTICAL AND HORIZONTAL ALIGNMENT	No indication of movement	
MONOLITH JOINTS	Not visible	
CONSTRUCTION JOINTS	None visible	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR Flat/Sloping Ogee	Surface of weir very rough - evidence of erosion 2" deep. Generally surface covered with green slime on surface.	Concrete surface should be repaired to prevent further erosion.
APPROACH CHANNEL	Wide and unobstructed except for one tree that has blown over at right edge of channel.	Tree should be removed.
DISCHARGE CHANNEL	Boulders, no obstructions between dam bridge immediately downstream.	
BRIDGE AND PIERS OVER SPILLWAY	None	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Appeared abandoned years ago. Concrete surface badly eroded and spalled. Many surface cracks. The large rocks imbedded in mortar spalling & loosening up. Evidence of a little repair work at lower right corner of structure - appeared to be only surficial repair. Underside of concrete.	See Page 2 "Surface Cracks and Concrete Surfaces"
APPROACH CHANNEL	Wide and unobstructed except for one tree that has blown over at right edge of channel.	Tree should be removed.
DISCHARGE CHANNEL	Boulders. No obstructions between dam and bridge immediately downstream.	
BRIDGE AND PIERS		
GATES AND OPERATION EQUIPMENT	Not operable. Wood gate (6' H X 7' W) - D/S face badly deteriorated; seepage through wood 30-50 gpm. U/S face filled in with large stones.	See Page 2 "Surface Cracks and Concrete Surfaces"

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed.	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OTHER	None observed.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes are gentle, with lawns and some trees in the area immediately upstream of the dam.	
SEDIMENTATION	Not visible beneath water surface.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Boulders. No obstructions between dam and bridge immediately downstream.	
SLOPES	Gentle to steep. Trees next to channel.	
APPROXIMATE NO. OF HOMES AND POPULATION	No homes or commercial structures. No permanent population. Primarily recreational and aesthetic use.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	No original plans were disclosed. Plans for this report were developed from visual inspection.
REGIONAL VICINITY MAP	Prepared for this report.
CONSTRUCTION HISTORY	The only available records indicated that the dam has ledge rock foundation.
TYPICAL SECTIONS OF DAM	Prepared for this report from visual inspection.
HYDROLOGIC/HYDRAULIC DATA	None disclosed.
OUTLETS - PLAN	None disclosed.
- DETAILS	None disclosed.
- CONSTRAINTS	None disclosed.
- DISCHARGE RATINGS	None disclosed.
RAINFALL/RESERVOIR RECORDS	None disclosed.

ITEM	REMARKS
DESIGN REPORTS	None disclosed.
GEOLOGY REPORTS	None disclosed.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None disclosed.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None disclosed.
POST-CONSTRUCTION SURVEYS OF DAM	None disclosed.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SERVICES	Unknown.
MODIFICATIONS	New Jersey Department of Environmental Protection files indicate that fill has been placed to block the gate structure, prior to 1948.
HIGH POOL RECORDS	None disclosed.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None disclosed.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	During December 1948 storm the fill placed in gate structure eroded draining the dam and causing damage to a mill building which was below the dam.
MAINTENANCE OPERATION RECORDS	None disclosed.

ITEM	REMARKS
SPILLWAY PLAN	No original plans were disclosed.
SECTIONS	Cross-section for this report was prepared from visual inspection.
DETAILS	
OPERATING EQUIPMENT	None.
PLANS & DETAILS	

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 116 square miles - hilly

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 491.4 (15.8 ac-ft)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 495.2 (53.7 ac-ft)

ELEVATION MAXIMUM DESIGN POOL: (test flood) 499.9 feet

ELEVATION TOP DAM: 495.2

CREST: free overflow concrete spillway

a. Elevation 491.4

b. Type concrete approximate ogee shape

c. Width 12.8 feet

d. Length 125 feet

e. Location Spillover center, perpendicular to river flow

f. Number and Type of Gates None

OUTLET WORKS: None

a. Type

b. Location

c. Entrance Inverts

d. Exit Inverts

e. Emergency Draindown Facilities

HYDROMETEORLOGICAL GAGES: None

a. Type

b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 3246 cfs

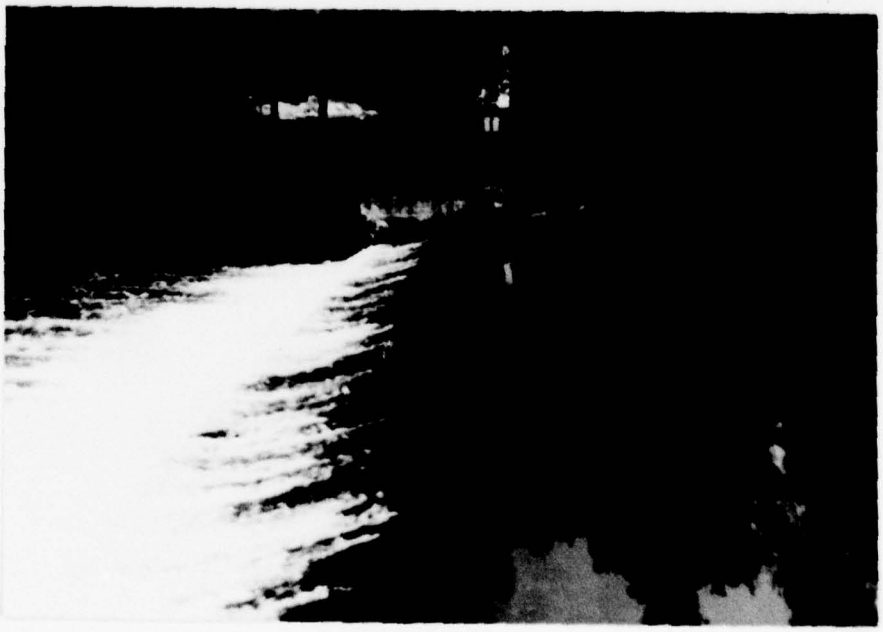
APPENDIX 2

PHOTOGRAPHS

POWERVILLE DAM

14 MAY 1979

VIEW OF DAM LOOKING EAST



14 MAY 1979

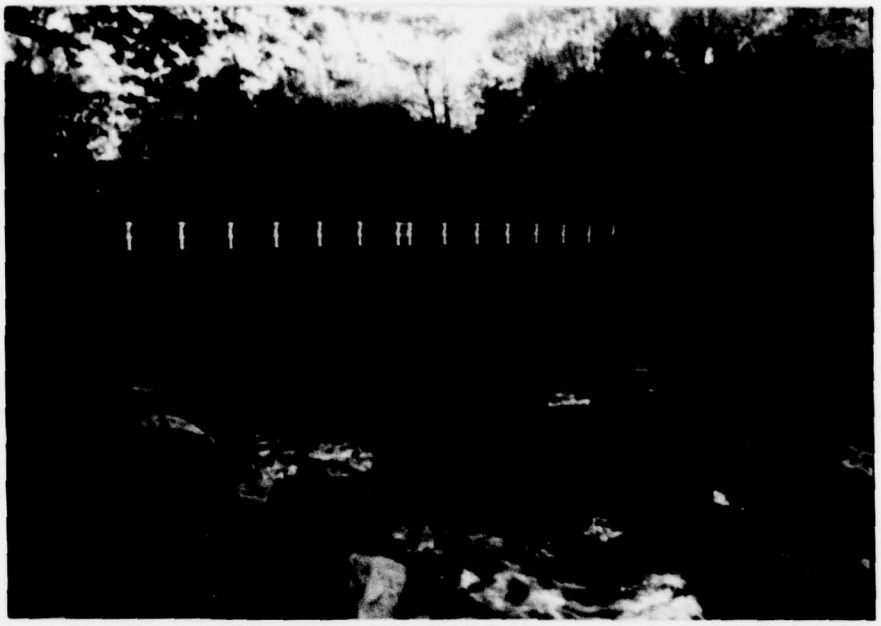
VIEW OF SPILLWAY AND RIGHT ABUTMENT LOOKING WEST

14 MAY 1979

UPSTREAM POOL LOOKING NORTHWEST

14 MAY 1979

UPSTREAM POOL LOOKING NORTHEAST

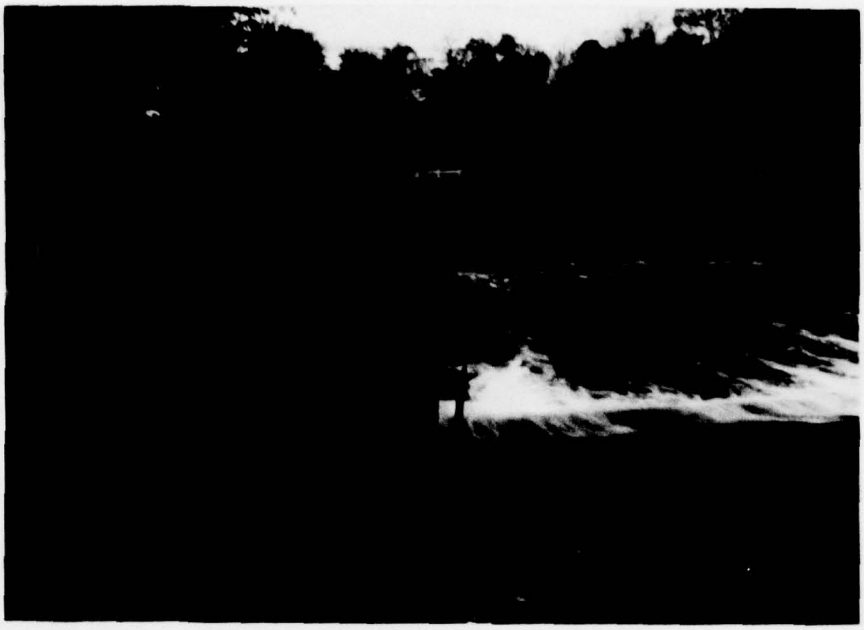


14 MAY 1979

N. MAIN ST. BRIDGE DOWNSTREAM OF THE DAM

14 MAY 1979

DOWNSTREAM VIEW FROM THE N. MAIN ST. BRIDGE

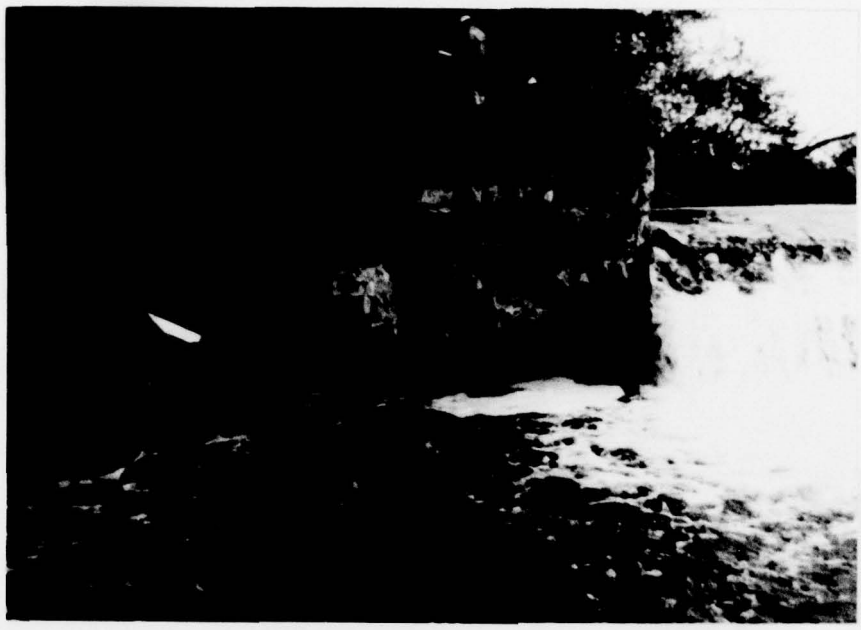


14 MAY 1979

UPSTREAM SIDE OF EAST ABUTMENT

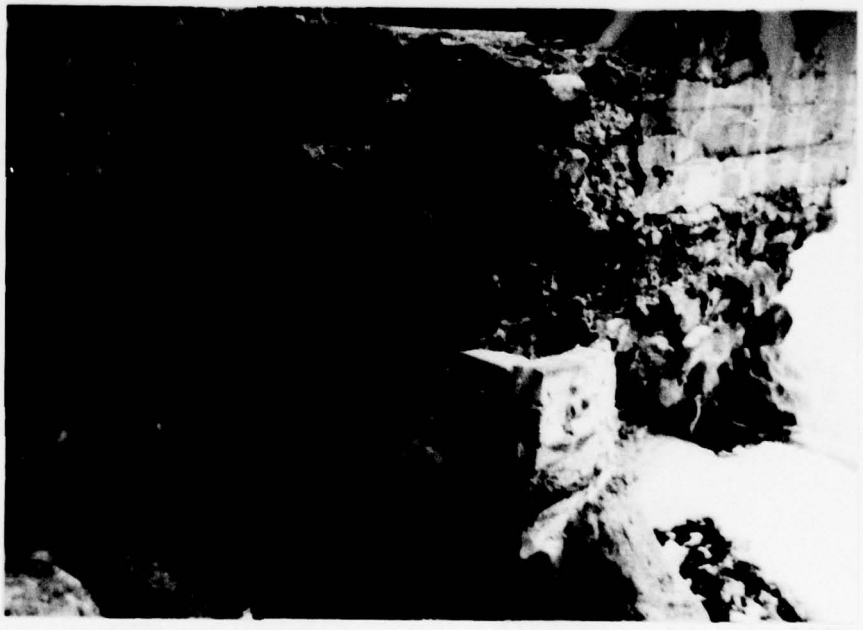
14 MAY 1979

DOWNSTREAM SIDE OF EAST ABUTMENT



14 MAY 1979

DOWNSTREAM SIDE OF WEST ABUTMENT



14 MAY 1979

REMAINS OF OLD RACEWAY STRUCTURE (WEST ABUTMENT)

14 MAY 1979

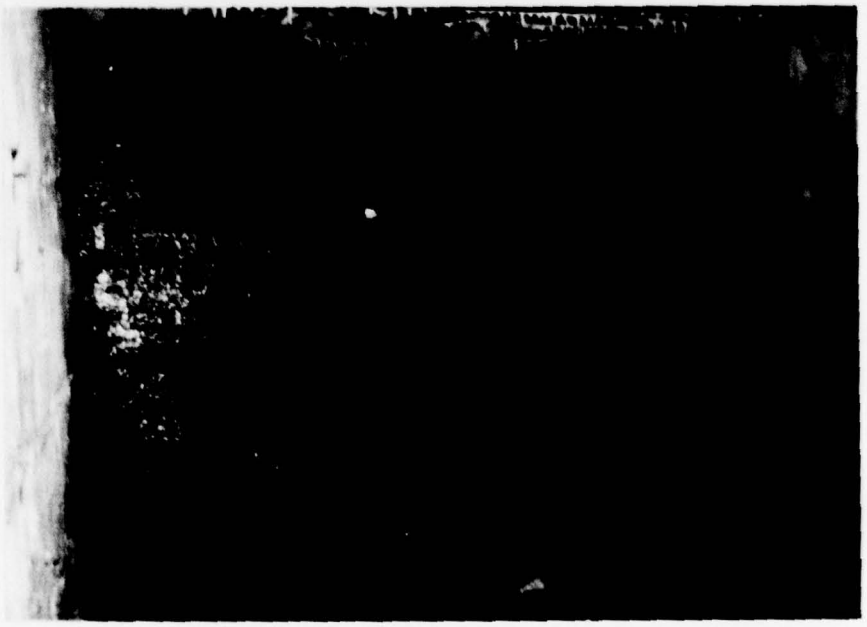
WEST ABUTMENT LOOKING WEST

14 MAY 1979

TOP VIEW OF OLD GATE STRUCTURE (WEST ABUTMENT)

14 MAY 1979

STONE WALL AT DOWNSTREAM SIDE OF OLD RACEWAY
(WEST ABUTMENT)



14 MAY 1979

LOOKING UPSTREAM AT INTERIOR
OF THE OLD GATE STRUCTURE

14 MAY 1979

VIEW TOWARD POWERVILLE ROAD FROM WEST ABUTMENT

APPENDIX 3

HYDROLOGIC COMPUTATIONS

POWERVILLE DAM

Anderson-Nichols & Company, Inc. Subject H & H

Sheet No. 1 of 10
Date 08-03-77
Computed
Checked EDD

JOB NO. 3290-07 POWERVILLE DAM

SQUARES 1/4 IN. SCALE

HYDROLOGICAL COMPUTATIONS

POWERVILLE DAM

LOCATION : MORRIS COUNTY, N.J.

DRAINAGE AREA: 116 SQ. MILES

EVALUATION CRITERIA: SIZE - SMALL
HAZARD - SIGNIFICANT

APPROACH : SNYDER'S METHOD

SNYDER'S LAG T_p - 17.7 Hours

SNYDER'S PEAKING COEFFICIENT C_p - 0.44

48 hour PMP STORM

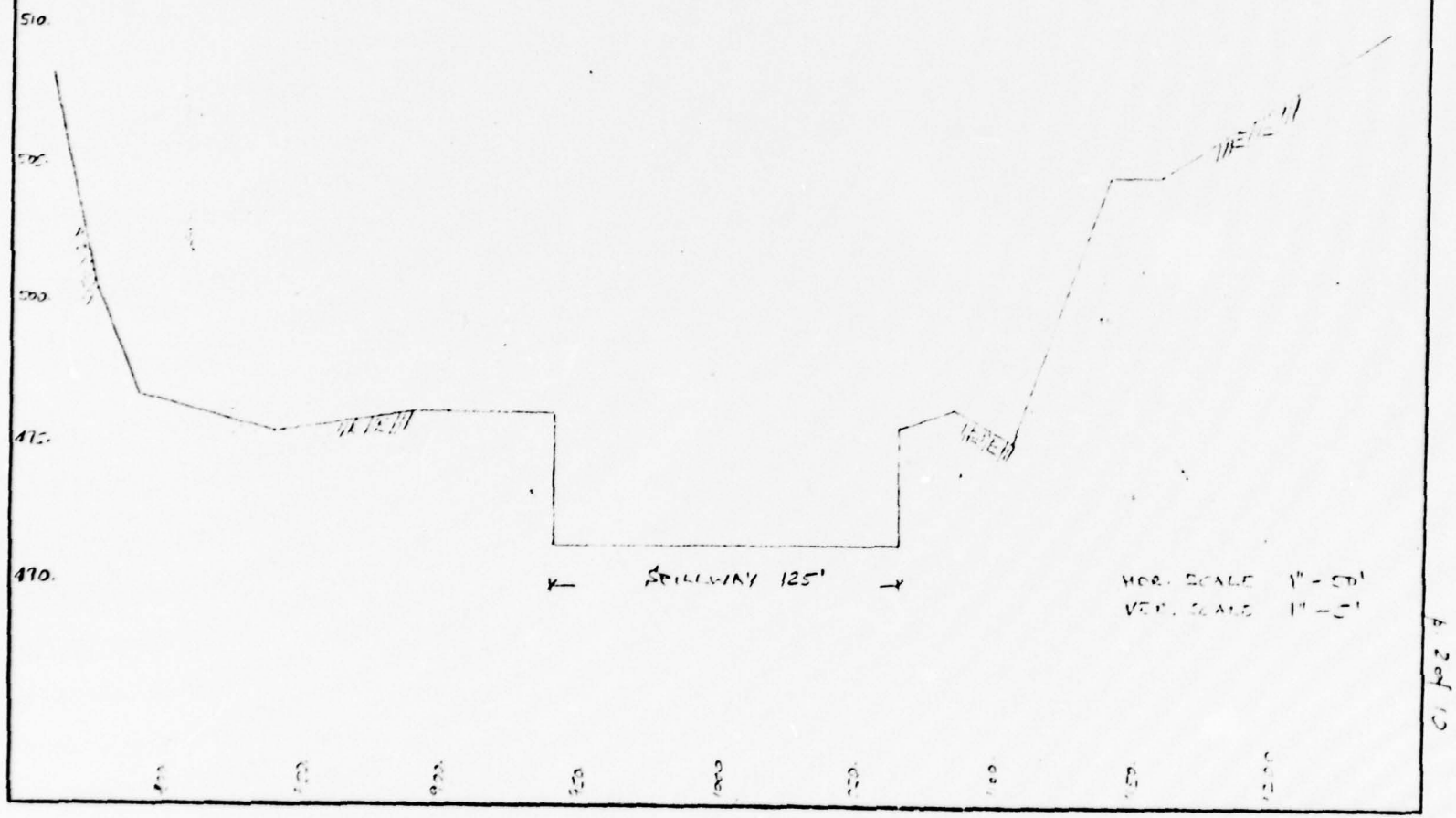
1. DAM LOCATED IN ZONE 6 PMP - 22.2"

2. ADJUSTMENT FACTORS

DURATION (hr)	% of 24 hr
0-6	83 %
0-12	96 %
0-24	106 %
0-48	120 %

ANDERSON - NICHOLS & CO. INC.
SUBJECT: H&H. JOB: 3290-07 POWERVILLE DAM
COMPUTED: J. Cz. CHKD: FOD 08-06-79

POWERVILLE DAM, N.J. - X-SECTION ALONG THE CREST OF SPILLWAY



Anderson-Nichols & Company, Inc. Subject H & H.

Sheet No. 3 of 10
Date
Computed
Checked EDD

JOB NO. 3290-07 POWERVILLE DAM

POWERVILLE DAM - CALCULATION FOR RATING CURVE

$Q = CAL \cdot H^{3/2}$

	OVER THE SPILLWAY ONLY				OVER THE OVERBANKS ONLY		TOTAL FLOW
	C = 3.5						
Q =	3.5 · 125 · 0.5 $^{3/2}$	=	155				155
	" " 1.0 $^{3/2}$	=	148				445
	" " 1.5 $^{3/2}$	=	804				804
	" " 2.0 $^{3/2}$	=	1240				1240
	" " 2.5 $^{3/2}$	=	1730				1730
	" " 3.0 $^{3/2}$		2275				2275
	" " 3.5 $^{3/2}$		2865				2865
	" " 4.0 $^{3/2}$		3500				3500
	" " 4.5 $^{3/2}$		4175				4175
	" " 4.8 $^{3/2}$		4600				4600
	" " 5.0 $^{3/2}$		4890		+ 315		= 5200
	" " 5.5 $^{3/2}$		5645		+ 745		= 6390
DECREASED	C " " 6.0 $^{3/2}$		6430		+ 1930		= 8360
3.43	" " 7.0 $^{3/2}$		7920.		+ 3460		= 11380.
3.23	" " 8.0 $^{3/2}$		9136		+ 5420		= 14556.
~320	" " 9.0 $^{3/2}$		10800		+ 7700		= 18500

FLOW OVER THE TOP OF THE DAM WITHOUT SPILLWAY — C = 2.8

Q =	2.8 · 192 · 0.7 $^{3/2}$	=	315	
	" 202 · 1.2 $^{3/2}$	=	795	
	" 211 · 2.2 $^{3/2}$	=	1930	
	" 216 · 3.2 $^{3/2}$	=	3460	
	" 225 · 4.2 $^{3/2}$	=	5420	
	" 232 · 5.2 $^{3/2}$	=	7700	
	" 239 · 6.2 $^{3/2}$	=	10245	
	" 242 · 7.2 $^{3/2}$	=	13090	
	" 249 · 8.2 $^{3/2}$	=	16570	

ANDERSON - NICHOLS & CO., INC.

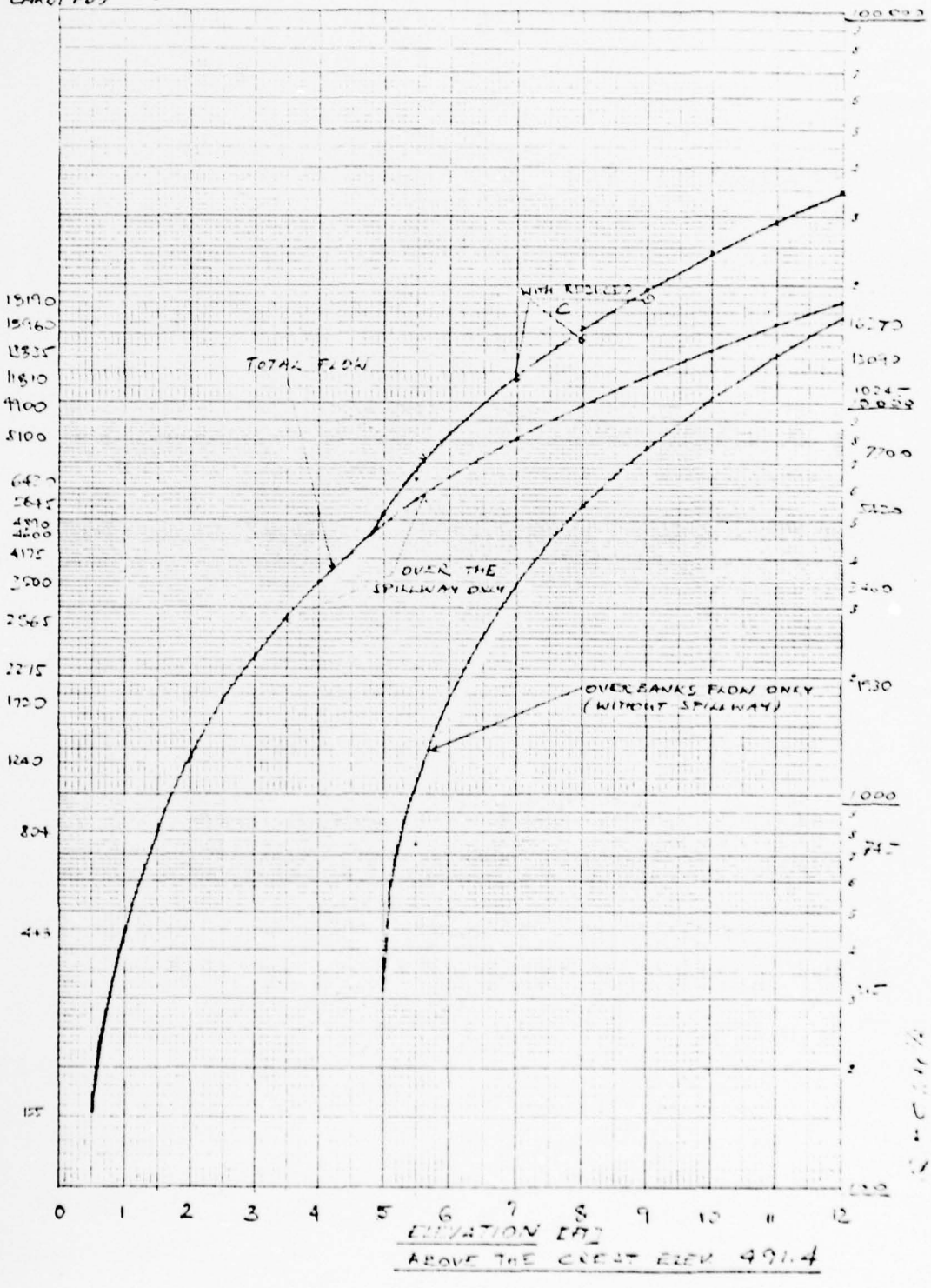
P. 4 of 10

JOB NO. 3290-07

06-05-79

SUBJECT: H&H POWERVILLE DAM - RATING CURVE

COMPUTED BY: CHAD FOD J.L.



Anderson-Nichols & Company, Inc. Subject H & H. Sheet No. 5 of 10

JOB NO. 3290-07 POWERVILLE DAM Date [illegible] Computed [illegible] Checked [illegible]

SQUARES 1/4 IN. SCALE

RATING TABLE FOR N. MAIN ST. BRIDGE

1. ASSUME RECTANGULAR BOX WITH WINGWALL FLARE 20° TO 0°

B = 80' L = 42' D = 13' BOTTOM ELEV. 482.00

FROM CHART No. 6 (HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL — U.S. DEPART. OF COMMERCE, BUREAU OF PUBLIC ROADS)

Q	Q/B	HW/D	HW	ELEV.
5000	62.5	.58	7.5	489.5
7500	94.	.77	10.0	492.
10000	125.	.93	12.09	494.1
12000	150.	1.08	14.04	496.
14000	175.	1.21	15.73	497.7
16000	200.	1.36	17.68	499.7
20000	250.	1.71	22.23	504.2

CALCULATIONS FOR BRIDGE WEIR

C = 2.9

ELEV.	H.	L.	Q
495.1	0.		
495.5	.4	23	16.
496.	.9	50	120.
496.5	1.4	68	315.
497.	1.9	100	730.
497.5	2.4	120	1250.
498.0	2.9	150	2074.
498.5	3.4	175	3070.
499.	3.9	210	4520.

Anderson-Nichols & Company, Inc. Subject N. Main St. Bridge

JOB NO. 3290-07 POWERVILLE DAM

Sheet No. 6 of 10
Date 06-07-77
Computed
Checked EDD

SQUARES 1/4 IN. SCALE

COMPOSITE RATING TABLE FOR N. MAIN ST. BRIDGE

ELEV.	BRIDGE Q	WEIR Q	TOTAL Q
495	11000	0	11000
495.5	11500	16	11516
496.	12000	120	12120
496.5	12500	315	12815
497.	12000	720	12720
497.5	13500	1250	14750
498.	14000	2074	16074
498.5	14500	3070	17570
499.	15000	4530	19530

FROM HEC-1 CALCULATION - ½ PMF Q = 16278

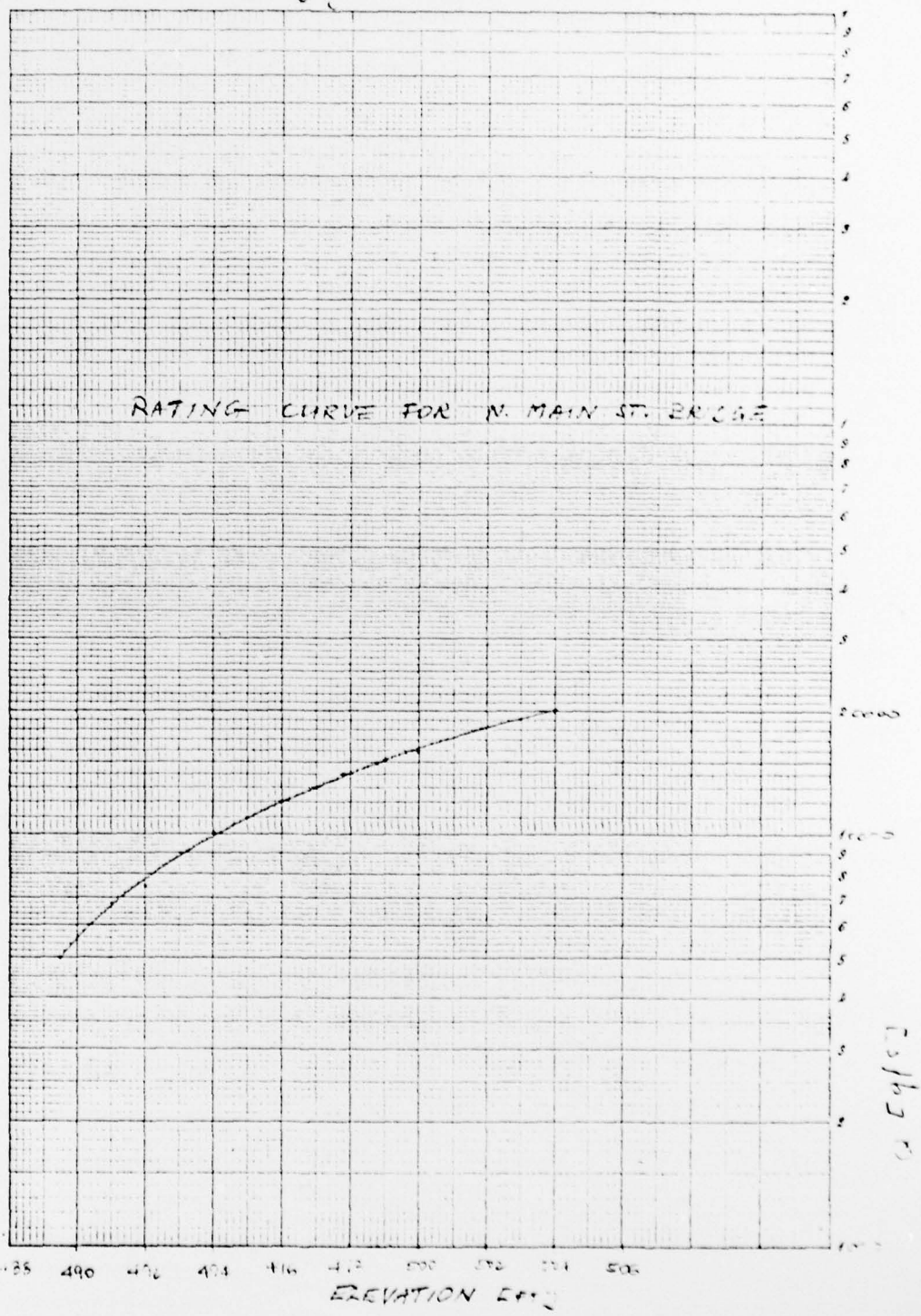
½ PMF ELEV. @ BRIDGE ≈ 498.

- ½ PMF ELEV. @ DAM = 499.6

CALCULATIONS OF DECREASE IN DISCHARGE COEFFICIENT FOR SUBMERGED OVERFLOW SPILLWAY (USING BUREAU OF RECLAMATION CHART; U.S. ARMY ENG. WATERWAYS EXPERIMENT STATION)

Q	ELEV. AT THE BRIDGE	ELEV. AT THE DAM	% OF DECREASE	hd	He	d	hd/He	hd - d / He
16278	498	499.6	3%	1.6	8.2	12.1	.2	1.96
12120	496	498.5	2.8%	2.5	9.1	11.1	.35	2.0

ANDERSON-NICHOLS & CO. INC. JOB NO. 3290-07 p 7 of 10
SUBJECT: H&H. POWERVILLE DAM
06-07-79 COMPUTED: J.G. CHKD: FDD



Anderson-Nichols & Company, Inc. Subject H & H.

Sheet No. 8 of 10
Date 12-05-79
Computed JD
Checked EDS CL

JOB NO. 3290-07 POWERVILLE DAM

SQUARES 1/4 IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

ESTIMATED SLOPE .5 IN (ABOVE THE DAM)

STORAGE CALCULATION

ELEV.	H.	L.	ESTIMATED WIDTH	STORAGE [AC-FT]
491.4	7.5	1500	120.	16.8
492.4	8.5	1700	140.	23.2
493.4	9.5	1800	160.	31.4
495.4	11.5	2300	180.	54.6
497.4	13.5	2700.	200.	83.7
499.4	15.5	3100.	210.	115.8
501.4	17.5	3500.	220.	154.7
503.4	19.5	3900.	230.	200.8

Anderson-Nichols & Company, Inc. Subject H & H

Sheet No. 9 of 10
Date 06-13-79
Computed JG
Checked EDB

JOB NO. 3290-07 POWERVILLE DAM

SQUARES 1/4 IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

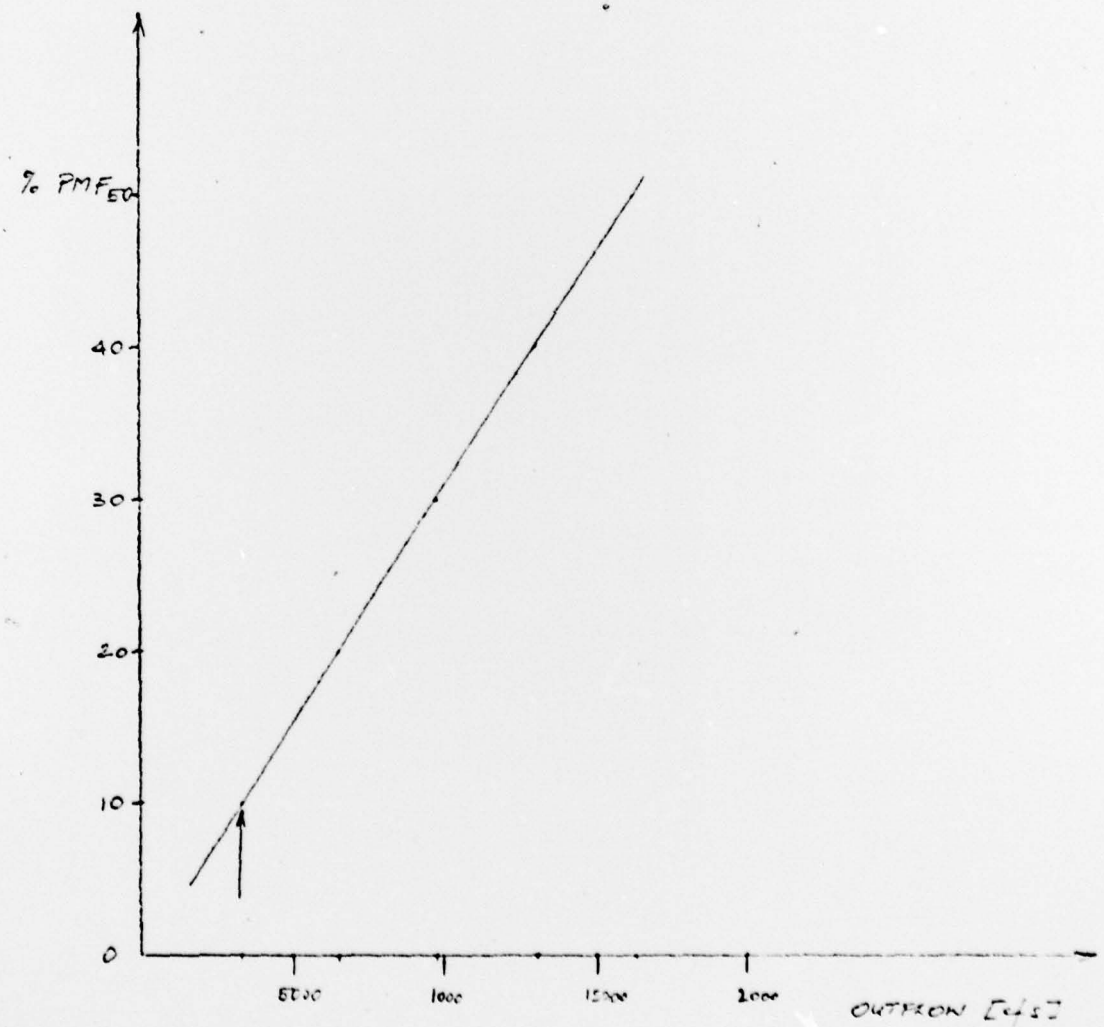
POWERVILLE DAM - SUMMARY

ELEV.	H [FT] ABOVE SPILLWAY	Q [cfs]	STORAGE [AC-FT]
491.4	0.	0.	16.8
491.9	.5	155.	—
492.4	1.	448.	23.2
492.9	1.5	804.	—
493.4	2.0	1240.	31.4
493.9	2.5	1730.	—
494.4	3.0	2275	—
494.9	3.5	2865.	—
495.4	4.0	3500.	54.6
495.9	4.5	4175.	—
496.2	4.8	4600.	—
496.4	5.0	5200	—
496.9	5.5	6290.	—
497.4	6.0	8360.	83.7
498.4	7.0	11380.	—
499.4	8.0	14556.	115.8
500.4	9.0	18500.	—
501.4	10.0	—	154.7

ANDERSON-NICHOLS & CO. INC.
SUBJECT: H&H
COMPUTED: J.G. CHKD: ROD

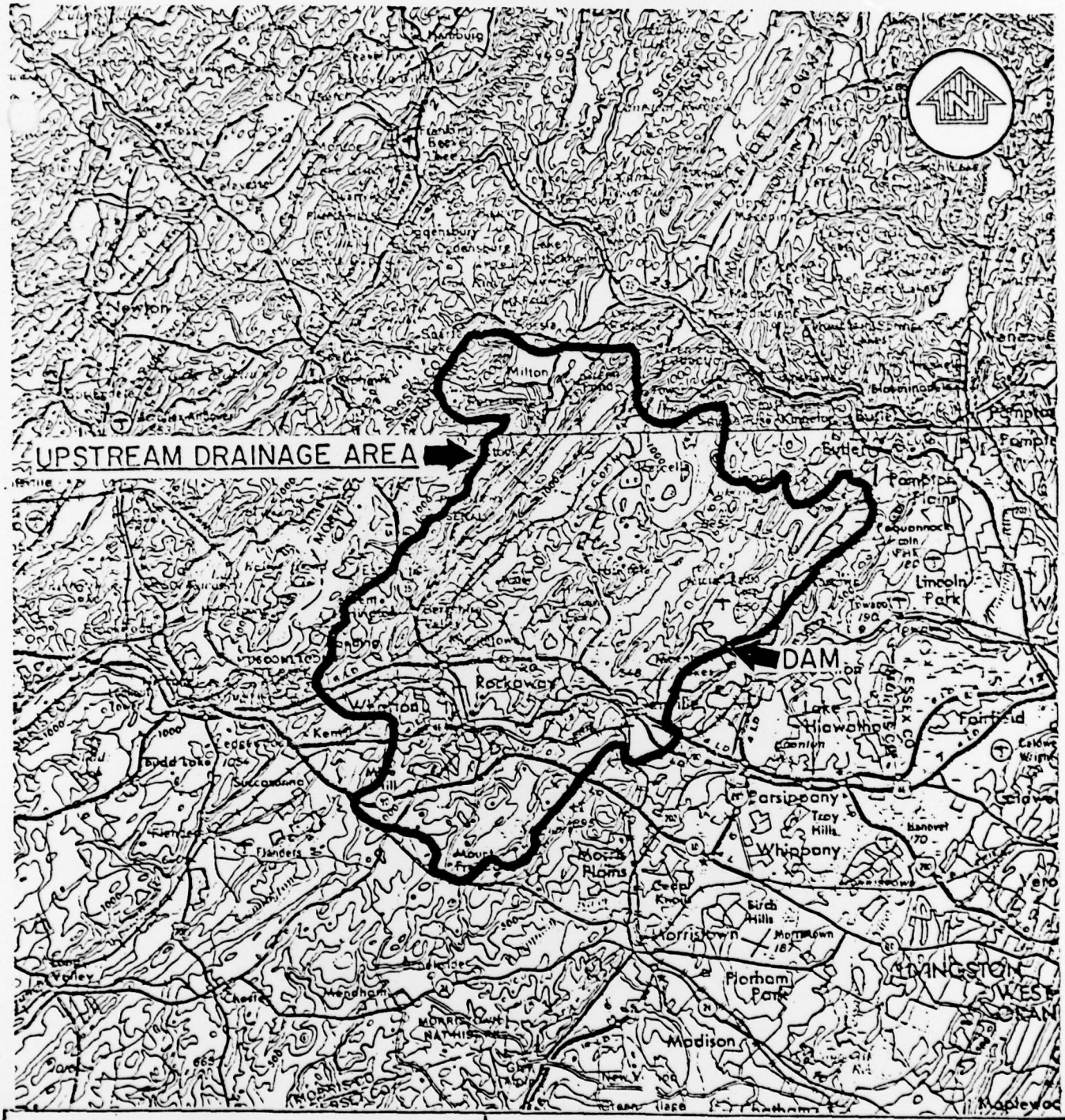
POWERVILLE DAM

OVERTOPPING POTENTIAL



DAM OVERTOPS AT APPROX EL. 495.2 WITH Q = 3246 cfs

∴ DAM CAN PASS 10% OF PMF



NATIONAL PROGRAM OF INSPECTION
OF NON-FED. DAMS

POWERVILLE DAM
BOONTON TOWNSHIP, NEW JERSEY

REGIONAL VICINITY MAP

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

ANDERSON-NICHOLS & CO., INC. BOSTON, MA

SCALE IN MILES

0 5 10

MAP BASED ON U.S.G.S. 1:250,000 SERIES TOPOGRAPHIC MAPPING. NK 18-8 SCRANTON, PA., N.J., N.Y. 1944, REVISED 1969. NK 18-11 NEWARK, N.J., PA., N.Y. 1944, REVISED 1969.

HEC-1 OUTPUT

POWERVILLE DAM

```
**********************************
* DOD HYDROGRAPH PACKAGE (HEC-1)
* SAFETY VERSION      JULY 1978
* LAST MODIFICATION  26 FEB 79
**********************************

RUN  DATE= 79/06/11.
     TIME= 14.54.41.
```

JOD 3290-07 POWERVILLE DAM BOONTON,N.J. NJ# 25-81 US# 174
OVERTOPPING ANALYSIS ANDERSON-NICHOLS & CO. INC. CONCORD,N.H.
0.1,0.2,0.3,0.4 AND 0.5 MULTIPLES OF OMF FROM 48-HOUR PMP

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
120	1	0	0	0	0	5	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .10 .20 .30 .40 .50

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

DEVELOP INFLOW HYDROGRAPH FOR POWERVILLE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A1	0	0	0	0	1	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	116.00	0.00	116.00	.87	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	88.00	96.00	106.00	120.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.50	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 17.70 CP= .44 NTA= 0

RECESSION DATA
STRTQ= 200.00 QRCSN= 0.00 RTIOR= 1.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=18.35 AND R=28.74 INTERVALS

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 17.70 HOURS, CP= .44 VOL= .96

23.	87.	181.	294.	421.	561.	711.	869.	1034.	1202.
1360.	1501.	1623.	1727.	1812.	1874.	1917.	1930.	1900.	1840.
1777.	1716.	1657.	1601.	1546.	1493.	1442.	1393.	1345.	1299.
1255.	1212.	1170.	1130.	1092.	1054.	1018.	983.	950.	917.
886.	856.	826.	798.	771.	744.	719.	694.	671.	648.
625.	604.	583.	563.	544.	526.	508.	490.	473.	457.
442.	427.	412.	398.	384.	371.	358.	346.	334.	323.
312.	301.	291.	281.	271.	262.	253.	244.	236.	228.
220.	213.	205.	198.	192.	185.	179.	173.	167.	161.
155.	150.	145.	140.	135.	131.	126.	122.	118.	114.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	.02	0.00	.02	200.	1.03	13.00	61	0.00	0.00	0.00	29419.
1.01	2.00	2	.02	0.00	.02	200.	1.03	14.00	62	0.00	0.00	0.00	28441.
1.01	3.00	3	.02	0.00	.02	200.	1.03	15.00	63	0.00	0.00	0.00	27490.
1.01	4.00	4	.02	0.00	.02	200.	1.03	16.00	64	0.00	0.00	0.00	26566.
1.01	5.00	5	.02	0.00	.02	200.	1.03	17.00	65	0.00	0.00	0.00	25670.
1.01	6.00	6	.02	0.00	.02	200.	1.03	18.00	66	0.00	0.00	0.00	24800.
1.01	7.00	7	.03	0.00	.03	200.	1.03	19.00	67	0.00	0.00	0.00	23959.
1.01	8.00	8	.03	0.00	.03	200.	1.03	20.00	68	0.00	0.00	0.00	23146.
1.01	9.00	9	.03	0.00	.03	200.	1.03	21.00	69	0.00	0.00	0.00	22361.
1.01	10.00	10	.03	0.00	.03	200.	1.03	22.00	70	0.00	0.00	0.00	21603.
1.01	11.00	11	.03	0.00	.03	200.	1.03	23.00	71	0.00	0.00	0.00	20871.
1.01	12.00	12	.03	0.00	.03	200.	1.04	0.00	72	0.00	0.00	0.00	20164.
1.01	13.00	13	.22	0.00	.22	200.	1.04	1.00	73	0.00	0.00	0.00	19481.
1.01	14.00	14	.27	0.00	.27	200.	1.04	2.00	74	0.00	0.00	0.00	18822.
1.01	15.00	15	.34	0.00	.34	200.	1.04	3.00	75	0.00	0.00	0.00	18185.
1.01	16.00	16	.85	.40	.45	209.	1.04	4.00	76	0.00	0.00	0.00	17570.
1.01	17.00	17	.31	.16	.15	239.	1.04	5.00	77	0.00	0.00	0.00	16976.
1.01	18.00	18	.25	.10	.15	290.	1.04	6.00	78	0.00	0.00	0.00	16402.
1.01	19.00	19	.03	0.00	.03	357.	1.04	7.00	79	0.00	0.00	0.00	15848.
1.01	20.00	20	.03	0.00	.03	436.	1.04	8.00	80	0.00	0.00	0.00	15313.
1.01	21.00	21	.03	0.00	.03	524.	1.04	9.00	81	0.00	0.00	0.00	14796.
1.01	22.00	22	.03	0.00	.03	620.	1.04	10.00	82	0.00	0.00	0.00	14296.
1.01	23.00	23	.03	0.00	.03	722.	1.04	11.00	83	0.00	0.00	0.00	13814.
1.02	0.00	24	.03	0.00	.03	829.	1.04	12.00	84	0.00	0.00	0.00	13349.
1.02	1.00	25	.13	0.00	.13	939.	1.04	13.00	85	0.00	0.00	0.00	12899.
1.02	2.00	26	.13	0.00	.13	1047.	1.04	14.00	86	0.00	0.00	0.00	12465.
1.02	3.00	27	.13	0.00	.13	1146.	1.04	15.00	87	0.00	0.00	0.00	12045.
1.02	4.00	28	.13	0.00	.13	1234.	1.04	16.00	88	0.00	0.00	0.00	11640.
1.02	5.00	29	.13	0.00	.13	1309.	1.04	17.00	89	0.00	0.00	0.00	11249.
1.02	6.00	30	.13	0.00	.13	1372.	1.04	18.00	90	0.00	0.00	0.00	10871.
1.02	7.00	31	.26	.11	.15	1425.	1.04	19.00	91	0.00	0.00	0.00	10506.
1.02	8.00	32	.26	.11	.15	1469.	1.04	20.00	92	0.00	0.00	0.00	10153.
1.02	9.00	33	.26	.11	.15	1507.	1.04	21.00	93	0.00	0.00	0.00	9813.
1.02	10.00	34	.26	.11	.15	1533.	1.04	22.00	94	0.00	0.00	0.00	9484.
1.02	11.00	35	.26	.11	.15	1550.	1.04	23.00	95	0.00	0.00	0.00	9166.
1.02	12.00	36	.26	.11	.15	1572.	1.05	0.00	96	0.00	0.00	0.00	8860.
1.02	13.00	37	1.70	1.55	.15	1641.	1.05	1.00	97	0.00	0.00	0.00	8564.
1.02	14.00	38	2.04	1.89	.15	1828.	1.05	2.00	98	0.00	0.00	0.00	8277.
1.02	15.00	39	2.55	2.40	.15	2204.	1.05	3.00	99	0.00	0.00	0.00	8001.
1.02	16.00	40	6.46	6.31	.15	2915.	1.05	4.00	100	0.00	0.00	0.00	7734.
1.02	17.00	41	2.38	2.23	.15	4073.	1.05	5.00	101	0.00	0.00	0.00	7477.
1.02	18.00	42	1.87	1.72	.15	5641.	1.05	6.00	102	0.00	0.00	0.00	7228.
1.02	19.00	43	.19	.04	.15	7540.	1.05	7.00	103	0.00	0.00	0.00	6987.
1.02	20.00	44	.19	.04	.15	9685.	1.05	8.00	104	0.00	0.00	0.00	6755.
1.02	21.00	45	.19	.04	.15	12020.	1.05	9.00	105	0.00	0.00	0.00	6531.
1.02	22.00	46	.19	.04	.15	14503.	1.05	10.00	106	0.00	0.00	0.00	6314.
1.02	23.00	47	.19	.04	.15	17083.	1.05	11.00	107	0.00	0.00	0.00	6105.
1.03	0.00	48	.19	.04	.15	19698.	1.05	12.00	108	0.00	0.00	0.00	5903.
1.03	1.00	49	0.00	0.00	0.00	22265.	1.05	13.00	109	0.00	0.00	0.00	5708.
1.03	2.00	50	0.00	0.00	0.00	24670.	1.05	14.00	110	0.00	0.00	0.00	5520.
1.03	3.00	51	0.00	0.00	0.00	26827.	1.05	15.00	111	0.00	0.00	0.00	5338.
1.03	4.00	52	0.00	0.00	0.00	28692.	1.05	16.00	112	0.00	0.00	0.00	5162.
1.03	5.00	53	0.00	0.00	0.00	30239.	1.05	17.00	113	0.00	0.00	0.00	4992.
1.03	6.00	54	0.00	0.00	0.00	31448.	1.05	18.00	114	0.00	0.00	0.00	4829.
1.03	7.00	55	0.00	0.00	0.00	32275.	1.05	19.00	115	0.00	0.00	0.00	4670.
1.03	8.00	56	0.00	0.00	0.00	32681.	1.05	20.00	116	0.00	0.00	0.00	4473.
1.03	9.00	57	0.00	0.00	0.00	32657.	1.05	21.00	117	0.00	0.00	0.00	4309.
1.03	10.00	58	0.00	0.00	0.00	32185.	1.05	22.00	118	0.00	0.00	0.00	4150.
1.03	11.00	59	0.00	0.00	0.00	31375.	1.05	23.00	119	0.00	0.00	0.00	4022.
1.03	12.00	60	0.00	0.00	0.00	30416.	1.06	0.00	120	0.00	0.00	0.00	3892.
									SUM	23.18	17.67	5.51	12342432.
										(589.)(449.)(140.)(350831.97)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	32681.	32018.	27083.	16286.	1237206.
CMS	925.	907.	767.	461.	35036.
INCHES		2.57	8.69	15.67	16.54
MM		65.22	220.66	398.07	420.04
AC-FT		15876.	53718.	96908.	102255.
THOUS CU M		19583.	66260.	119534.	126130.

HYDROGRAPH AT STA A1 FOR PLAN 1, RTIO 5

100.	100.	100.	100.	100.	100.	100.	100.	100.	100.
100.	100.	100.	100.	100.	105.	120.	145.	178.	218.
262.	310.	361.	415.	470.	523.	573.	617.	655.	686.
712.	735.	753.	766.	775.	784.	820.	914.	1102.	1458.
2036.	2821.	3770.	4843.	6010.	7251.	8541.	9849.	11132.	12335.
13414.	14346.	15119.	15724.	16137.	16340.	16328.	16092.	15688.	15208.
14709.	14220.	13745.	13283.	12835.	12400.	11979.	11573.	11181.	10802.
10436.	10082.	9741.	9411.	9093.	8785.	8488.	8201.	7924.	7656.
7398.	7148.	6907.	6674.	6449.	6232.	6023.	5820.	5624.	5435.
5253.	5077.	4906.	4742.	4583.	4430.	4282.	4139.	4001.	3867.
3738.	3614.	3494.	3378.	3266.	3157.	3053.	2952.	2854.	2760.
2669.	2581.	2496.	2414.	2335.	2236.	2154.	2079.	2011.	1946.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	16340.	16009.	13541.	8143.	618643.
CMS	463.	453.	383.	231.	17518.
INCHES		1.28	4.34	7.84	8.27
MM		32.61	110.33	199.04	210.02
AC-FT		7938.	26859.	48454.	51128.
THOUS CU M		9792.	33130.	59767.	63065.

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HYDROGRAPH ROUTING

OVERTOPPING ANALYSIS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A2	1	0	0	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
0	0	0	0.000	0.000	0.000	-1.	-1

STAGE	491.40	491.90	492.40	492.90	493.40	493.90	494.40	494.90	495.40	495.90
	496.20	496.40	496.90	497.40	498.40	499.40	500.40			
FLOW	0.00	155.00	448.00	804.00	1240.00	1730.00	2275.00	2865.00	3500.00	4175.00
	4600.00	5200.00	6390.00	8360.00	11380.00	14556.00	18500.00			
CAPACITY=	17.	23.	31.	55.	84.	116.	155.	201.		
ELEVATION=	491.	492.	493.	495.	497.	499.	501.	503.		

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
491.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
495.2	0.0	0.0	0.

STATION A2, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

133.	89.	104.	99.	100.	100.	100.	100.	100.	100.
100.	100.	100.	100.	100.	103.	115.	138.	172.	213.
256.	304.	354.	407.	462.	516.	566.	611.	650.	682.
709.	731.	751.	764.	774.	784.	815.	901.	1076.	1400.
1944.	2722.	3654.	4705.	5975.	7156.	8510.	9725.	11082.	12242.
13369.	14279.	15089.	15684.	16125.	16328.	16339.	16109.	15718.	15236.
14741.	14249.	13775.	13310.	12862.	12426.	12005.	11597.	11206.	10825.
10460.	10104.	9763.	9432.	9113.	8804.	8507.	8214.	7936.	7668.
7409.	7159.	6918.	6685.	6459.	6249.	6037.	5835.	5638.	5450.
5266.	5087.	4917.	4751.	4595.	4453.	4297.	4158.	4018.	3885.
3755.	3630.	3509.	3389.	3278.	3169.	3064.	2963.	2865.	2771.
2679.	2592.	2506.	2424.	2345.	2251.	2163.	2090.	2019.	1955.

STORAGE

20.	19.	19.	19.	19.	19.	19.	19.	19.	19.
19.	19.	19.	19.	19.	19.	19.	20.	20.	21.
21.	22.	22.	23.	23.	24.	25.	25.	26.	26.
26.	26.	27.	27.	27.	27.	27.	28.	30.	33.
39.	47.	56.	67.	74.	79.	84.	91.	98.	104.
110.	114.	118.	121.	124.	125.	125.	123.	122.	119.
117.	114.	112.	110.	107.	105.	103.	101.	99.	97.
95.	93.	91.	89.	88.	86.	84.	83.	82.	81.
80.	79.	78.	78.	77.	76.	74.	73.	72.	71.
70.	69.	68.	67.	66.	65.	63.	62.	60.	59.
57.	56.	55.	54.	53.	52.	51.	50.	49.	48.
47.	46.	45.	44.	44.	43.	42.	41.	40.	40.

STAGE

491.8	491.7	491.7	491.7	491.7	491.7	491.7	491.7	491.7	491.7
491.7	491.7	491.7	491.7	491.7	491.7	491.8	491.8	491.9	492.0
492.1	492.2	492.2	492.3	492.4	492.5	492.6	492.6	492.7	492.7
492.8	492.8	492.8	492.8	492.9	492.9	492.9	493.0	493.2	493.6
494.1	494.8	495.5	496.2	496.7	497.1	497.4	497.9	498.3	498.7
499.0	499.3	499.5	499.7	499.8	499.8	499.9	499.8	499.7	499.6
499.4	499.3	499.2	499.0	498.9	498.7	498.6	498.5	498.3	498.2
498.1	498.0	497.9	497.8	497.6	497.5	497.4	497.4	497.3	497.2
497.2	497.1	497.0	497.0	496.9	496.8	496.8	496.7	496.6	496.5
496.4	496.4	496.3	496.3	496.2	496.1	496.0	495.9	495.8	495.7
495.6	495.5	495.4	495.3	495.2	495.1	495.1	495.0	494.9	494.8
494.7	494.7	494.6	494.5	494.5	494.4	494.3	494.2	494.2	494.1

PEAK OUTFLOW IS 16339. AT TIME 57.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	16339.	16013.	13540.	8143.	618403.
CMS	463.	453.	383.	231.	17511.
INCHES		1.28	4.34	7.84	8.27
MM		32.62	110.32	199.05	209.94
AC-FT		7940.	26857.	48457.	51108.
THOUS CU M		9794.	33128.	59771.	63040.

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50
HYDROGRAPH AT	A1	116.00	1	3268.	6536.	9804.	13072.	16340.
		(300.44)		(92.54)(	185.08)(	277.63)(	370.17)(	462.71)(
ROUTED TO	A2	116.00	1	3268.	6534.	9801.	13072.	16339.
		(300.44)		(92.54)(	185.02)(	277.53)(	370.14)(	462.67)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	491.40	491.40	495.20
STORAGE	17.	17.	52.
OUTFLOW	0.	0.	3246.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	495.22	.02	52.	3268.	2.00	57.00	0.00
.20	496.94	1.74	77.	6534.	32.00	57.00	0.00
.30	497.88	2.68	91.	9801.	46.00	56.00	0.00
.40	498.93	3.73	108.	13072.	55.00	56.00	0.00
.50	499.85	4.65	125.	16339.	63.00	57.00	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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TERMINAL 161 TIME OUT.

APPENDIX 4

REFERENCES

POWERVILLE DAM

APPENDIX 4

REFERENCES

POWERVILLE DAM

1. U.S. Army Corps of Engineers, Hydrologic Engineering Center, "Flood Hydrograph Package (HEC-1) for Dam Safety Inspections - Users Manual," Davis, California, September 1978.

2. Brater, Ernest F. and King, Horace, Handbook of Hydraulics, Sixth Edition, McGraw-Hill, N.Y., 1976.

3. U.S. Bureau of Public Roads, "Design Charts for Open Channel Flow," October 1960.

4. U.S. Department of Commerce, Weather Bureau, "Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1,000 Square Miles and Durations of 6, 12, 24 and 48 Hours," Hydrometeorological Report No. 33, Washington, April 1956.

5. Reference Data, Dams in New Jersey, No. 25-81, from N.J. DEP files, dated 25 March 1931.

6. Report regarding dam inspection from H.C. Wittner, dated 20 April 1947.